Heat-Treated Steel, St. 3kp brand for Building Structures

strength of the welded zone and on the second property - from tensile tests. The dependence of the impact strength in the zone of welding on the consumption of power per unit of length of welds is shown in Fig.8 and on the test temperature - Fig.10. The results of tests of welded joints welded manually and automatically are given in Table 3. The preparation of edges for welding is shown in Fig.9. Conclusions: Thermal treatment (hardening without annealing) of low carbon steel St.3kp for structural purposes is advantageous as the metal obtains increased strength and lowered tendency to brittle fracture in comparison with the hot rolled steel of the same type. Plates of 12 to 40 mm thick hardened without annealing possess the yield strength not less than 30 kg/mm^2, the impact strength after mechanical ageing 4 to 6 $kg\ cm^2$ and the threshold of brittleness not above -60^0C. The beneficial influence of thermal treatment is a decrease in the size of ferrite grains during hardening. The mechanical properties of welded joints remain near to those of the metal itself. Welding can be carried out under the same conditions as

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Heat-Treated Steel, St. 3kp Grade for Building Structures

for hot rolled steel. A more complete utilisation of the increased strength of hardened carbon steel would be possible on development of special electrodes and electrode wire. During the production of hardened steel the upper limit of its carbon content should be limited. The steel investigated can be recommended for welded structures. The following participated in the work: from Nizhniy Tagil Combine: Ye. Z. Freydenzon, L. A. Natutskaya, N. A. Chinikova, A. I. Arshinov, A. Ye. Berkser, I. A. Burdina and from TsNIIChm: I. M. Vyshvaynyuk and Yu. I. Lebedev. There are 3 tables, 10 figures and 5 references, all of which are Soviet.

ASSOCIATIONS: TsNIIChM and GPI Proyektstal'konstruktsiya

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PRIDANTSEV, M. V.

AUTHORS: Pridantsev, M. V., Krylova, A. R.

TITLE: Methods for Testing the Thermal Resistivity of Steel Sheets and of Alloys (Metodika ispytaniya na termostoykost' listovykh staley i splavov)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol. 24, Nr 2, pp. 204-205 (USSR)

ABSTRACT: The method described here has been applied since 1950 and does not show the deficiencies of other investigation methods, e. g. the insufficient fixing of the investigation samples. The sheet samples destined for investigation are 120 x 120 mm in size and have 5 holes in the centre, whereas they are firmly fixed to the basis at the corners with four bolts. The heating is performed by means of a glass-blower gas flame during 1 minute and the coolin to a desired temperature in an air jet of required temperature also during 1 minute. This heating and coolin is repeated until cracks are formed from the centre hole to the other four holes. As may be seen from a figure, a crater-like buckle and a distortion of the sample platelet are formed during this process. The crack formation can be observed with the

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Methods for Testing the Thermal Resistivity of Steel Sheets and of Alloys Sheets

help of a pocket lens. The deformation of the sheet sample is computed from the distortion of the centre hole (expressed in mm). It was observed, that the thermal resistivity of an austenitic Cr-Ni-alloy decreases with an increase of sheet thickness. An increase of size of the grains leads to the same effect. Based on the principle of the method described simultaneous investigation methods for several samples can be developed. There are 5 figures and 1 reference.

ASSOCIATION: Central Scientific Research Institute of Ferrous Metallurgy (Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii)

AVAILABLE: Library of Congress

1. Steel-Thermodynamic properties 2. Heat resistant alloys-Thermodynamic properties

Card 2/2

FRIDANTSEV, M.V., prof.; BAT', A.A., inzh.; GLADSHTEYN, L.I., inzh.; LEVINZON, Kh.Sh., inzh.

The ST.Zkp chilled steel as a new prospective material for steel structures. Stroi. prom. 36 no.2:38-39 F '58. (MIRA 11:2)

1. Gosudarstvennyy proyektnyy institut Proyektstal'konstruktsiya i TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii. (Steel, Structural)

18(2) PHASE I BOOK EXPLOITATION SOV/2192

Pridantsev, Mikhail Vasil'yevich, and Kseniya Alekseyevna Lanskaya

Stali dlya kotlostroyeniya (Steels for the Manufacture of Boilers) Moscow, Metallurgizdat, 1959. 303 p. 4,500 copies printed.

Ed.: G.K. Shreyber; Ed. of Publishing House: Ye. N. Berlin; Tech. Ed.: P.G. Islent'yeva.

PURPOSE: This book is intended for scientific workers of institutes and educational institutions, and engineers and designers dealing with the production and application of heat-resistant steels.

COVERAGE: The book presents data on changes in the structure and properties of steels subjected to high temperatures and stresses for a long period of time and data on the effect of carbon, alloying elements, impurities, and structural factors on the properties of pearlite and austenite heat-resistant boiler steels. Problems of the theory of creep, heat resistance, and the principles of alloying are discussed. Information is also given on

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Steels for the Manufacture of Boilers

the properties of pearlite and austenite heat-resistant steels for boiler installation and on other designs intended for long-time service at temperatures of 500-700° C. The authors thank Senior Scientific Worker R.M. Kireyeva of the Steel Institute of TsNIIChM and laboratory technicians R.A. Raykel'son and L. M. Maksimova. There are 115 references: 74 Soviet, 33 English, 5 German, and 3 French.

TABLE OF CONTENTS:

PRIDANTSEV, M.V.

18(7) PHASE I BOOK EXPLOITATION SOV/3355

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. IV (Studies on Heat-Resistant Alloys, vol. 4), Moscow, Izd-vo AN SSSR, 1959. 400 p. Errata slip inserted. 2,200 copies printed.

Ed. of Publishing House: V. A. Klimov; Tech. Ed.: A. P. Guseva; Editorial Board: I. P. Bardin, Academician; G. V. Kurdyumov, Academician; N. V. Ageyev; Corresponding Member, USSR Academy of Sciences; I. A. Oding, I. M. Pavlov, and I. F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgists concerned with the structural metallurgy of alloys.

COVERAGE: This is a collection of specialized studies of various problems in the structural metallurgy of heat-resistant alloys. Some are concerned with theoretical principles, some with descriptions of new equipment and methods, others with properties of specific materials. Various phenomena occurring under specified conditions are studied and reported on. For details, see Table of Contents. The articles are accompanied by a number of references, both Soviet and non-Soviet.

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Studies (Cont.)

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PRIDANTSEV, M.V.
P.2-

PHASE I BOOK EXPLOITATION SOV/3559

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. 5 (Investigations of Heat-Resistant Alloys, Vol 5) Moscow, Izd-vo AN SSSR, 1959. 423 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V.A. Klimov; Tech. Ed.: I.F. Kuz'min; Editorial Board: I.P. Bardin, Academician, G.V. Kurdyumov, Academician, N.V. Ageyev, Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Oding, I.M. Pavlov, and I.F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers in metallurgy, and may also be of interest to students of advanced courses in metallurgy.

COVERAGE: This book, consisting of a number of papers, deals with the properties of heat-resisting metals and alloys. Each of the papers is devoted to the study of the factors which affect the properties and behavior of metals. The effects of various elements such as Cr, Mo, and W on the heat-resisting properties of various alloys are studied. Deformability and workability

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Investigations of Heat-Resistant

of certain metals as related to the thermal conditions are the object of another study described. The problems of hydrogen embrittlement, diffusion and the deposition of ceramic coatings on metal surfaces by means of electrophoresis are examined. One paper describes the apparatus and methods used for growing monocrystals of metals. Boron-base metals are critically examined and evaluated. Results are given of studies of interatomic bonds and the behavior of atoms in metal. Tests of turbine and compressor blades are described. No personalities are mentioned. References accompany most of the articles.

TABLE OF CONTENTS:

Investigations of Heat-Resistant (Cont.)

Investigations of Heat-Resistant (Cont.)

SOV/3559

Investigations of Heat-Resistant (Cont.)

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AVAILABLE: Library of Congress

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Card 9/9

24(8) PHASE I BOOK EXPLOITATION SOV/2117

Soveshchaniye po eksperimental'noy tekhnike i metodam vysokotemperaturnykh issledovaniy, 1956

Eksperimental'naya tekhnika i metody issledovaniy pri vysokikh temperaturakh; trudy soveshchaniya (Experimental Techniques and Methods of Investigation at High Temperatures; Transactions of the Conference on Experimental Techniques and Methods of Investigation at High Temperatures) Moscow, AN SSSR, 1959. 789 p. (Series: Akademiya nauk SSSR. Institut metallurgii. Komissiya po fiziko-khimicheskim osnovam proizvodstva stali) 2,200 copies printed.

Resp. Ed.: A.M. Samarin, Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: A.L. Bankvitser.

PURPOSE: This book is intended for metallurgists and metallurgical engineers.

COVERAGE: This collection of scientific papers is divided into six parts: 1) thermodynamic activity and kinetics of high-temperature processes 2) constitution diagram studies 3) physical properties of liquid metals and slags 4) new analytical methods and production of pure metals 5) pyrometry, and 6) general questions. For more specific coverage, see Table of Contents.

Otlivanov, S.G., and I.A. Sokolov. Industrial Application of Thermocouples for Controlling the Temperature of Liquid Steel 604

The article describes the practice of the Kuznetsk Metallurgical Plant in Stalinsk of using submerged platinum-platinorhodium thermocouples for controlling the temperature of liquid steel. Optimum limits of temperature were established for various periods during the final melting. Some advantages of this method of temperature control are: fewer heats tapped at too high or too low a temperature, threefold reduction in electric-furnace stainless-steel ingots scrapped because of surface defects, improved quality of macrostructure, and longer life of furnace hearths and roofs. Some improvements must be made, however, to extend the life of the thermocouples.

Svede-Shvets, N.I., and M.V. Pridantsev. Thermocouple for Short-time Measurement of Temperatures Reaching 2300° C 619

A new thermocouple has been developed for short-time measurements of liquid-steel temperatures. The positive thermoelectrode is tungsten, and the negative a molybdenum alloy containing 0.5 percent aluminum. The thermocouple can measure temperatures within a range of 100-2300° C, developing a maximum thermoelectromotive force of the order of 20 mv.

M.V. Pridantsev

82567
S/123/60/000/009/003/017
A004/A001

18.1250
Translation from: Referativnyy zhurnal. Mashinostroyeniye, 1960, No. 9, p. 24,
43264

AUTHORS: Pridantsev, M.V., Estulin, G.V.

TITLE: The Effect of Small Additions of Rare-Earth and Alkali Earth Elements, Zirconium and Boron, on the Properties of Heat-Resisting Alloys on a Nickel Base

PERIODICAL: V sb.: Metallovendiye i term. obrabotka. ("Stal'", 1958, Prilozh.), Moscow, 1959, pp. 68-92

TEXT: The authors present the results of investigating the effects of additions of Ca (0.05 - 0.20%), Ba (0.15 - 0.30%), Ce (0.010 - 0.125%), La (0.010 - 0.075%), B (0.002 - 0.020%) and Zr (0.05 - 0.80%) on the properties of the ЭИ 437 (EI437) grade heat-resisting alloy of the following composition (in %): C = 0.03-0.05, Cr = 20-21, Ti = 2.5-2.8, Al = 0.8-1.0 and Ni= 75-76 (separate tests were carried out with specimens of the EI437 grade alloy with an additional 4-5% Mo and W-content). It was found that small additions of rare-earth (Ce, La) and alkali-earth (Ca, Ba) elements in heat-resisting alloys

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The Effect of Small Additions of Rare-Earth and Alkali Earth Elements, Zirconium and Boron, on the Properties of Heat-Resisting Alloys on a Nickel Base

on a nickel base substantially increase their rupture strength at temperatures in the range of 700 - 900°C as well as their hot deformation ability. Small additions of B (0.005-0.010%) increase the rupture strength, creep resistance and fatigue strength, while the ductility reserve during long-time rupture and the toughness of the material are substantially increased, and the sensitivity to stress concentrations is reduced. Small additions of Zr (0.05-0.15%) have a positive effect on the heat resistance and ductility of these alloys. Theoretical aspects are presented which explain the positive rôle played by small additions of elements in the alloys.

Translator's note: This is the full translation of the original Russian abstract.

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SOV/135-59-3-10/24

25(1)

AUTHORS: Pridantsev, M.V., Doctor of Technical Sciences, and Astaf'yev, A.S., Candidate of Technical Sciences

TITLE: The Effect of Additives on the Development of Hot Cracks in Weld Metal (Vliyaniye primesey na razvitiye goryachikh treshchin v naplavlennom metalle)

PERIODICAL: Svarochnoye proizvodstvo, 1959, Nr 3, pp 18-22 (USSR)

ABSTRACT: The article presents a detailed description of experiments carried out in 1955-1957, at the welding laboratory of TsNIIChERMET, to investigate the effect of slight additions of various elements into welding wire of austenitic steel on the development of hot cracks in weld metal. The following conclusions were reached: 1) The presence of up to 0.014 % boron in welding wire increases the formation of hot cracks in weld metal; 2) an addition of up to 0.042 % cerium and 0.4 % calcium did not suppress hot cracks; the increase of the calcium concentration in the wire lead to an increased formation of hot cracks in welding under "BKF" flux, but not in welding under "AN-26" flux; 3) additions of up to 0.4 % of barium had practically no effect (with flux "AN-26");

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The Effect of Additives on the Development of Hot Cracks in Weld Metal

4) a slight content of lead (about 0.0017 %), tin (about 0.0016 %) and an increased concentration of sulfur in wire intensified the cracking. It is concluded that the wires, fluxes and electrode coatings are to be kept as free as possible of these elements. There are 6 tables, 10 graphs, 1 diagram and 8 Soviet references.

ASSOCIATION: TsNIIChERMET

PRIDANTSEV, M.V.

Some problems of the heat-resistance theory. Issl.po zharopr. splav. 4:280-286 '59. (MIRA 13:5)
(Heat-resistant alloys)
(Phase rule and equilibrium)

PRIDANTSEV, M.V.

Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii

Spetsial'nyye stali i splavy (Special Steels and Alloys) Moscow, Metallurgizdat, 1960. 488 p. (Series: Its: Sbornik trudov, vyp. 17) Errata slip inserted. 4,000 copies printed.

Sponsoring Agencies: Institut kachestvennykh staley; Gosudarstvennyy planovyy komitet Soveta Ministrov SSSR; and Glavnyye upravleniye nauchno-issledovatel'skikh i proyektnykh organizatsiy.

Ed.: M.V. Pridantsev; Ed. of Publishing House: A L. Ozeretskaya; Tech. Ed.: V.V. Mikhaylova.

PURPOSE: This book is intended for engineering and research personnel in the metallurgical and machine-building industries.

COVERAGE: This book contains papers on the physical properties of special industrial steels and alloys. Individual papers treat: the problem of flake-formation in steels and preventive measures, the effect of alloying additions and heat treatment on the structure and properties of steel, steel corrosion and preventive measures, and the properties of chromium-nickel alloys. There are 120 references: 87 Soviet, 22 English, 9 German, and 2 French.

S/028/60/000/008/007/010
B013/B054

AUTHORS: Pridantsev, M. V., Levinzon, Kh.Sh., Matyushina, N. V.

TITLE: Thermally Treated Plate- and Wide-strip Carbon Steel

PERIODICAL: Standartizatsiya, 1960, No. 8, pp. 37 - 38

TEXT: The Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii (Central Scientific Research Institute of Ferrous Metallurgy) and other scientific research organizations found during investigations that the use of thermal hardening is well convenient in metallurgical mass production. Preliminary calculations have shown that its economic profit will much exceed the costs of its introduction into mass production. The Komitet standartov, mer i izmeritel'nykh priborov (Bureau of Standards, Measures, and Measuring Instruments) approved a new standard ГОСТ 9458-60 (GOST 9458-60) "Thermally Treated Plate- and Wide-strip Carbon Steel. Technical Specifications". It comes into force on October 1, 1960. It comprises plates and wide strips from 6 to 40 mm thickness produced from one metal sort. The same mechanical properties are established for all thicknesses. The mechanical properties of

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Thermally Treated Plate- and Wide-strip Carbon Steel

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thermally treated steels are mainly determined by 2 factors: the carbon content, and the plate thickness. According to GOST 9458-60, consumers are entitled to demand the supply of thermally hardened steel for welded constructions with a carbon content of no more than 0.20% and a sulfur content of no more than 0.050%. GOST 9458-60 has a limited running time of 2 years. Afterwards, it will be modified and defined more precisely on the basis of experience collected.

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85832
S/133/60/000/009/010/015
A054/A029

18.1150

AUTHORS: Pridantsev, M.V., Doctor of Technical Sciences, Professor Estulin, G.V., Doctor of Technical Sciences

TITLE: The Influence of Alloying Constitutents With Low Solubility in Nickel-Chrome Alloys on the Properties of Nickel-Base Heat-Proof Alloys

PERIODICAL: Stal', 1960, No. 9, pp. 838-845

TEXT: Based on the theory that heat-resistance of alloys can be improved by the intensification of disperse hardening, by strengthening the interatomic bonds and by increasing the stability of the border layers, tests were carried out in order to determine the influence of some alloying elements on the properties of nickel-base heat-proof alloys. The chemical composition of the test alloys was as follows (in %): C 0.03-0.05; Si 0.4-0.6; Mn 0.3-0.4; S 0.006-0.008; P 0.010-0.015; Cr 20-21; Ti 2.4-2.7; Al 0.7-1.0; Ni the remainder. The following alloying elements were used (in %): Ti 1-5; Al 0.5-3.5; Cr 20-30; Nb 0.5-2.5; Be 0.02-0.35; Ta 1.5-10.5. The tendency of the alloys to mechanical deformation by heat and the resistance, the character of phase-transformation, the aptitude to disperse hardening were examined. From the tests, some of [illegible] Ni,

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85831

S/133/60/000/009/010/015
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The Influence of Alloying Constituents With Low Solubility in Nickel-Chrome Alloys on the Properties of Nickel-Base Heat-Proof Alloys

Ta and Be, it appeared that a high heat-resistance in nickel-base alloys of the ×20Н80Т (Kh20N80T) type could be obtained by simultaneous alloying with Ti and Al, these elements being used in such quantities which exceeded the limit of their solubility in nickel-chromium solutions. A satisfactory malleability of these alloys can be maintained by adding at the same time 1.5 - 1.9 Ti and 1.7-2.0 % Al. Raising the Al content from 1 to 2 % increases the amount of γ' phase and the heat resistance. This results in an increase in the softening temperature from 750-800°C to 850-910°C. The quantity of Ti to be added must not exceed 4.0-4.5 %; the minimum is 2.0-2.5 %. Of the elements, which have a low solubility in nickel-chrome solid solutions, niobium has the best effect on the heat resistance of the alloy. Unlike titanium and aluminum, however, this element has an unfavorable influence on the malleability of nickel-chrome base alloys. A satisfactory malleability of the ЭИ 437 (EI 437) type alloy can be obtained with a Ni content of 1.5-2.0 % and of the ЭИ 445 (EI 445) type alloy with 1.0-1.2 % Ni. The considerable improvement of heat resistance (by the addition of niobium) can be explained by the stabilization of the solid solution and by the increase in the softening temperature. Tantalum, beryllium

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The Influence of Alloying Constituents With Low Solubility in Nickel-Chrome Alloys on the Properties of Nickel-Base Heat-Proof Alloys

and zirconium take an immediate part in the disperse hardening of the alloys belonging to the Ni-Cr-Ti-Al system, by replacing part of the titanium in the stabilizing phase of the γ' type. Zirconium improves the heat-resistance only when added in very small amounts (0.10-0.15 %) to the EI 437 type alloys. An addition of less than 3 % tantalum has no great effect on the heat-resistance, whereas when added in larger quantities, it reduces the strength and the plasticity. Beryllium has an adverse effect on heat-resistance already when added in amounts as small as 0.015 % by weakening the interatomic bonds, intensifying the diffusion processes and lowering the softening temperature of the alloy. As regards hardness, it appears that Ti, Al, Ni, Ta and Be, i.e., elements having a relatively low solubility in solid nickel-chrome solutions, increase the hardness of the alloy, though to varying degrees. There are 11 figures, 2 tables and 17 references: 11 Soviet and 6 English.

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85491
S/133/60/000/010/011/013
A054/A029

18.1150

AUTHORS: Pridantsev, M.V., Doctor of Technical Sciences, Professor; Estulin, G.V., Doctor of Technical Sciences

TITLE: The Influence of Alloying Elements With High Solubility in Nickel-Chrome Solid Solutions on the Properties of Heat-Resistant Alloys

PERIODICAL: Stal', 1960, No. 10, pp. 936 - 945

TEXT: By reference to theoretical investigations it was concluded that heat-resistant alloys can be produced by strengthening the interatomic links in the solid solution, by adding to nickel-base heat-resistant alloys such elements which dissolve in the solid solution in considerable quantities (molybdenum, tungsten, vanadium, cobalt). Relevant tests were carried out between 1947 and 1955 with steels of the following composition (excl. nickel) in %: C 0.03 - 0.05; Si 0.4 - 0.6; Mn 0.3 - 0.4; S 0.006 - 0.008; P 0.010 - 0.015; Cr 20 - 21; Ti 2.4 - 2.7; Al 0.7 - 1.0. The following alloying elements were used in the meltings (%): Mo 2.5 - 20; W 1.5 - 20; V 3 - 11; Co 4 - 20. They were added partly one by one and partly simultaneously, by adding Mo and W in a total amount of 20 - 25%, Mo, W and Ni 10 - 12%, Mo, W and Co 30%, etc. In the tests

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The Influence of Alloying Elements With High Solubility in Nickel-Chrome Solid Solutions on the Properties of Heat-Resistant Alloys

Х20Н80Т (Kh20N80T), ЭИ444 (EI444), ЭИ445 (EI445) and ЭИ437 (EI437) type steels were used. The article deals with the tests in two parts, first analyzing the results of tests with Mo, W and V, next those of the tests with Co and with increased amounts of chrome and iron. It was found that elements with high solubility in nickel-chrome solid solutions have a favorable effect on the heat-resistance of nickel-chrome alloys. The best results were obtained with Mo, which improved heat-resistance, plasticity, creep and fatigue-resistance of the Kh20N80T type steels, when added in amounts of up to 18%. Tungsten improved the heat-resistance when a minimum amount of 7 - 8% was added and the same effect was observed when the two metals were added together up to a total amount of 10 - 15%. In the Kh20N80I type steels alloyed according to the above principles the softening temperature is about 850 - 900°C, i.e., 100 - 150°C higher than that of the EI437 type alloys. The improvement of the heat-resistance by the addition of Mo and W can be explained by the increase in resistance of the dispersed particles of the γ'-phase to coagulation and of the recrystallization temperature of the solid solution. Mo and W largely dissolved in the solid solution and only small amounts of these metals entered the structure of the γ'-phase. When

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The Influence of Alloying Elements With High Solubility in Nickel-Chrome Solid Solutions on the Properties of Heat-Resistant Alloys

more than 18 - 20% Mo and more than 20 - 22% W are added, the heat-resistance of the Kh20N80T type alloys decreases as the structure becomes coarse and heterogeneous on account of the separation of large particles of surplus intermetallic phases, rich in Mo and W. The addition of 10 - 30% cobalt to nickel-chrome alloys improved the heat-resistance, the plasticity, the toughness and also the malleability of the steel, because the interatomic links are strengthened, resulting in retardation of the diffusion processes and an increase in the softening temperature. Vanadium, even when added in an amount as small as 3.7%, has an adverse effect on the heat-resistance of the alloy and so has an increased amount of chrome (25 - 30%) when added to aging steels of the KhN80T type, because the heterogeneity of the structure is intensified (the formation of large particles in the solid α-solution on a chrome basis). The positive and the negative influence of various alloying elements on the heat-resistance of the alloys is discussed in detail and the theoretical conclusions drawn from the tests are also summarized, emphasizing that the favorable effect of the alloying elements on heat-resistant alloys must not be assessed alone by the effect of strengthening

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854 91

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The Influence of Alloying Elements With High Solubility in Nickel-Chrome Solid Solutions on the Properties of Heat-Resistant Alloys

due to dispersed hardening, but mainly by their influence on the softening temperature of the alloy. There are 14 figures, 2 tables and 21 references: 17 Soviet and 4 English.

IX

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85195

S/129/60/000/011/001/016
E073/E535

18.7500 1555

AUTHORS: Fel'dgandler, E. G., Engineer and Pridantsev, M. V., Doctor of Technical Sciences

TITLE: Phase Transformations in Type Х17Н7Ю (Kh17N7Yu) Steels

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1960, No.11, pp.2-7 + 1 plate

TEXT: The authors investigated steel of the following chemical composition: 0.075% C, 0.6% Mn, 0.31% Si, 16.4-16.9% Cr, 7.2-7.4% Ni, 0.6-1.2% Al, 0.02-0.04% N_2. To establish the relations between additional hardening and martensitic transformations after low temperature tempering, the authors investigated the kinetics of hardening and the kinetics of martensite transformation during quenching as a function of the temperature and the duration of low temperature annealing. The kinetics of martensitic transformation were studied on an Akulov anisometer on flat 3 x 5 x 25 mm specimens. Prior to the experiments, the specimens were vacuum annealed for 8 hours at 1050°C and, following that, they were subjected to intermediate treatment and etching (to a depth of 0.2 mm on each side). The temperature was measured by means of Pt/PtRh or copper constantan-thermocouples placed into the

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Phase Transformations in Type X17H7Yu (Kh17N7Yu) Steels

specimen itself. Non-correspondence between the temperature of maximum hardening and martensite formation does not depend on the intermediate treatment; tempering at 450 to 500°C for 3 hours has almost no effect at all on increasing the quantity of martensite but does cause a maximum strengthening of the steel. The temperature of the beginning of the reversible $\alpha \rightarrow \gamma$ transformation was measured magnetometrically and was found to be 550 to 570°C. Data given in a table show that additional hardening may occur at temperatures which are lower than the initial temperature of the reverse transformation. Therefore, additional strengthening after low temperature annealing cannot be explained by phase hardening during reversible $\alpha \rightarrow \gamma$ transformation. To elucidate the nature of this strengthening in the steel under investigation, the authors have studied the changes of other physical properties caused by tempering. The results have shown that holding the metal at lower tempering temperatures reduces the electric resistance and the volume, which indicates that processes of rejection occur which bring about an increase in the magnetic saturation and a change in the stability of the residual austenite. After tempering in the temperature range

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E073/E535

Phase Transformations in Type Х17Н7Ю (Kh17N7Yu) Steels

400 to 500°C, the magnetic saturation increases to an extent which is the greater the higher the aluminium content. To obtain confirmation that strengthening does take place during isothermal holding, the hardness was measured during tempering; for each tempering temperature 3 to 6 specimens were used; the testing was in vacuum for specimens subjected to annealing at 1050°C for 8 hours, quenching from 1050°C and tempering for 3 hours at 750°C. Increases in hardness were observed which are attributed to the rejection of an intermetallide. Chemical and X-ray analysis data of the residue indicate that the hardening of the investigated alloys is due to rejection of an intermetallide phase $(FeNi)_3Al$ which is enriched with iron and nickel. It is also necessary to consider the possibility of a slight strengthening as a result of rejection during tempering of martensite and of finely dispersed carbides. Thus, the obtained results lead to the conclusion that hardening (strengthening) of the investigated steel takes place as a result of separation of a phase which is rich in Ni, Fe and Al. There are 8 figure, 1 table and 11 references: 5 Soviet, 1 German and 5 English.

ASSOCIATION: TsNIIChM

Card 3/3

PRIDANTSEV, M.V., prof., doktor tekhn.nauk; LANSKAYA, K.A., kand.tekhn.nauk

Effect of carbon on the heat-resisting properties of low-alloy boiler steel. Sbor. trud. TSNIICHM no.17:80-85 '60. (MIRA 13:10)
(Steel alloys) (Heat-resistant alloys)

PRIDANTSEV, M.V., prof., doktor tekhn.nauk; LANSKAYA, K.A., kand.tekhn.nauk

New steel without molybdenum for cracking plants. Sbor. trud. TSNIICHM no.17:86-98 '60. (MIRA 13:10)
(Steel alloys--Thermal properties)

31217
S/123/61/000/020/005/035
A004/A101

18.1150

AUTHORS: Pridantsev, M. V., Merlina, A. V.

TITLE: The effect of barium and calcium on the "tenacity" of Nichrome grades

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no.20, 1961, 16, abstract 20A113 ("Sb. tr. Tsentr. n.-i. in-t chernoy metallurgii", 1960, no. 17, 349-357)

TEXT: The addition of Ba or Ca to Nichromes increases their mechanical properties at normal temperatures, heat resistance and tenacity. The addition of 0.6 - 1% Ba to alloys of ohmic resistance of the X15H60 (Kh15N60) and X20H80 (Kh20N80) grades increases the "tenacity" by a factor of 2 - 2.5; if 0.2 - 0.6% Ca are added, the "tenacity" of the Kh15N60 and Kh20N80 alloys increases by a factor of 4 - 6.

[Abstracter's note: Complete translation]

Card 1/1

20471
S/137/61/000/008/036/037
A060/A101

18.1150

AUTHOR: Pridantsev, M. V., Merlina, A. V.

TITLE: Nichrome-aluminum alloys for electric resistors

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 8, 1961, 22, abstract 8I180 ("Sb. tr. Tsentr. n.-i. in-t chernoy metallurgii", 1960, no. 17 365-385)

TEXT: The possibility was studied of producing cheaper nichromes by replacing Ni with aluminum. An investigation of the mechanical characteristics, scale resistance, microstructure, electrical resistance, temperature coefficient of electrical resistance of the alloys has shown that the introduction of 2% Al into alloys X15H60 and X15H40 (Kh15N60 and Kh15N40) is analogous to the increase of Ni content of these alloys by 20%. The alloy X15H60 YU-2 (Kh15N60Yu-2) is an equivalent replacement for nichrome X20H80 (Kh20N80) as a heating element for furnaces with operating temperature 1,175°C.

V. Kishenevskiy

[Abstracter's note: Complete translation.]

Card 1/1

28560 S/137/61/000/009/053/087
A060/A101

18.1150

AUTHORS: Pridantsev, M. V., Litvinenko, D. A.

TITLE: The influence of phosphorus upon a number of properties of nichrome austenitic steel

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 9, 1961, 15, abstract 9I97 ("Sb. tr. Tsentr. n.-i. in-t chernoy metallurgii", 1960, no. 17, 386 -397)

TEXT: Increased P content (up to ~ 0.4%) has practically no effect on the ductility of austenitic Cr-steel X25H20 (Kh25N20) under hot pressure treatment. The ductility of that steel drops sharply only at ~0.6% P content. The presence of ~ 0.4% P causes the phenomenon of dispersion hardening of steel after hardening and subsequent tempering at 600 - 850°C. Dispersion hardening in steel is connected with the separation from the solution of a second P-containing phase, which is, apparently, a solid solution of the phosphides of Fe, Ni and Cr. The possibility is shown of using P as an alloying element for increasing the heat-resisting properties of alloys, in particular, of austenitic Cr-Ni steel Kh25N20.

Card 1/2

28560 S/137/61/000/009/053/087
A060/A101

The influence of phosphorus ...

The alloying of steel with the P amount of ~0.4% sharply raises the magnitude of endurance strength of that steel under high temperatures and stresses.

T. Rumyantseva

[Abstracter's note: Complete translation]

Card 2/2

S/137/61/000/010/029/056
A006/A101

AUTHORS: Zimina, L.N., Pridantsev, M.V.

TITLE: Structural transformations in nickel base alloys

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 10, 1961, 26-27, abstract 10Zh169 ("Sb. tr. Tsentr. n.-i. in-t chernoy metallurgii", 1960, no. 17, 472 - 488)

TEXT: Alloys of the Ni-Ti system containing 5.4-9.1% Ti, and ЭИ-437 (EI 437) and ЭИ-445 (EI445) alloys, were subjected to metallographic and roentgenographic analyses. In Ni-Ti alloys the α phase appears during extended aging at 650 - 800°C, whose composition is close to Ni_3Ti, but which has a face-centered cubic lattice. The boundary of the formation of the hexagonal phase of Ni_3Ti (η) at 700°C corresponds to 6.8% Ti. In bi-phase alloys of the ($\gamma+\eta$) region, there is a cubic α' phase together with the laminar separation of the Ni_3Ti intermetallide during an extended period (>1,500 hrs at 700°C). The stability of this phase decreases with higher temperature, longer duration of aging and higher Ti content. In EI437 alloys decomposition of the solution proceeds in 2 stages: a) singling-out of the α'-phase with the face centered cubic lattice

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S/137/61/000/010/029/056
A006/A101

Structural transformations in nickel base alloys

with a parameter of 3.58 kilo-X. b) formation of a laminar phase of Ni_3Ti (η) with the hexagonal lattice (a = 5.10 Å, c = 8.31 Å, c/a = 1.63). The leading process in the regeneration of the cubic α'-phase into the hexagonal η-phase are diffusional shifts; therefore the regeneration rate depends on the aging temperature, the holding time, the strained state of the alloy and its chemical composition.

A. Fedoroyskiy

[Abstracter's note: Complete translation]

Card 2/2

22577
S/133/61/000/001/011/016
A054/A133

18.7100

AUTHORS: Fel'dgandler, E.G., Engineer, and Pridantsev, M.V., Doctor of Technical Sciences

TITLE: The Effect of Heat Treatment on Transformation Occuring in Type X17H 7N (Kh17N7Yu) Steels

PERIODICAL: Stal', 1961, No. 1, pp. 58 - 64

TEXT: The Central Scientific Research Institute for Ferrous Metallurgy studied the effect of the aluminum content and heat treatment on martensitic transformation in Kh17N7Yu type steels. The five melts of steel used in the tests differed only in aluminum content and contained 0.075 - 0.090% carbon, 16.54 - 16.88% chromium, 7.25 - 7.35% nickel, 0, 0.63, 0.94, 1.08 and 1.12% aluminum (see table 2). Details of heat treatment applied in the tests are given in Figure 1. In the tests the Akulov-type anisometer and flat, 3 x 5 x 25 mm specimens were used. The temperature was registered with platino-rhodium-platinum or copper-constantan thermocouples set directly in the specimen. All samples received the same initial heat treatment: high temperature annealing at 1,050°C for 8 h in vacuum. The specimens were then subjected to intermediate-temperature annealing at 700 - 1,000° C to determine the effect of the conditions of this treatment on the temperature

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22577

S/133/61/000/001/011/016
A/054/A033

The Effect of Heat Treatment on Transformations Occuring in Type X17H7Yu (Kh17N7 Yu) Steels

at the start of martensite transformation, (Fig. 2) and on the martensite formed during continuous cooling (Fig. 3). Intermediate-temperature annealing was followed by low-temperature annealing (aging) at 500-600°C. In some cases intermediate annealing was substituted by cold working with 2 - 40% reduction. Refrigeration treatment was not studied. Results of the investigations showed that the effect of intermediate-temperature annealing is determined by the annealing temperature and by the aluminum content of the steel. Annealing at 700 - 750°C produces the least stable austenite with a starting temperature of martensite transformation varying from 28 - 40°C for steel containing no aluminum to 100°C for steel with an aluminum content of 1.12% (Fig. 4). The amount of martensite formed in continuous cooling increases with increasing aluminum content. Double intermediate-temperature annealing for 2 x 1.5 h results in more martensite formed in continuous cooling than does single annealing for 3 h. Double annealing also increases ductility and corrosion resistance. Steel with 1.12% aluminum annealed twice at 750°C, for 2 x 1.5 h and aged at 550°C contained 80% martensite and showed a tensile strength of 128 kg/sq mm, yield strength of 112 kg/sq mm, 17% elongation and 44% reduction of area. Isothermal cooling after intermediate-temperature anneal-

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The Effect of Heat Treatment on Transformations Occuring in Type X17H7O (Kh17N7Yu) Steels

ing, i.e., continuous cooling, to a temperature somewhat above or below M_s [Abstracter's note: subscript s (starting) has been substituted for subscript н (nachalnaya)] stabilizes austenite, delaying martensitic transformation and reducing the amount of martensite formed in renewed continuous cooling. Austenite stabilisation occurs, however, only at high rates of isothermal cooling. The aging temperature must be at least 550 - 560°C; aging at 500°C has a fairly good effect on residual austenite. Only aging at 550 - 560°C raises M_s and increases the volume of gamma--to-alpha transformation taking place during cooling from aging temperatures. Prolonged holding and increased aluminum content act the same way as increased aging temperature (Fig. 11). Cold working also stabilizes austenite not transformed to martensite by plastic deformation; continuous cooling after cold working (without reheating) to a temperature as low as - 196°C does not increase the amount of martensite (Fig. 9). Additional martensitic transformation in continuous cooling occurs only after annealing at 550°C. There are 11 figures, 5 tables and 24 references, 16 Soviet, 8 Non-Soviet.

ASSOCIATION: TsNIIChM

Card 3/9

PRIDANTSEV, M.V.; FEL'DGANDLER, E.G.

Tendency of OKh17N7IU steel toward intercrystalline corrosion. Biul. TSIICHM no.4:44-46 '61. (MIRA 14:10)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii.

(Steel alloys--Corrosion)

21361
S/126/61/011/004/008/023
E111/E435

18.7500

AUTHORS: Fel'dgandler, E.G. and Pridantsev, M.V.

TITLE: Reverse Martensite Transformation During the Heating of Stainless Steels of the Transition Class

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.4, pp.551-556

TEXT: The authors have studied the temperature and kinetics of the reverse martensite transformation of transition class steels (i.e. those with austenite unstable on cooling), the temperature dependence of the magnetic saturation and the peculiarities of martensite transformation on heating. The types and compositions of steels studied are given in table 1. The reverse-transformation temperature was measured with an Akulov-type magnetometer. [Abstractor's note: Not described.] Isothermal heating was effected in tin baths which could be moved between the poles of the magnet. Specimens 3 x 5 x 25 mm, previously vacuum heated at 1050°C for 8 hours, hardened from this temperature and heated to 750°C were used. To differentiate between the effect of temperature dependence of magnetic saturation and that of the $\alpha(M) \rightarrow \gamma$ transformation, the gradual heating to 700°C with magnetic

Reverse Martensite ...

saturation measurement was periodically interrupted while the temperature was rapidly reduced to 250°C and further measurements carried out; the temperature was then quickly brought to the next high level. A similar procedure was used for studying the transformation kinetics. Fig.2 shows the relative change in magnetic saturation as a function of heating temperature for Х17Н7 (Kh17N7) steel with various aluminium contents (0 to 1.12%); Fig.3 shows the same functions for the various types of steel. The relative degree of the $\alpha \rightarrow \gamma$ transformation is shown as a function of tempering time (min) in Fig.4 for Kh17N7 and Х17Н7Ю Kh17N7Yu steels at 700 and 650°C for each. The effect of nickel, aluminium, molybdenum and tungsten is to raise the starting temperature of the reverse transformation (manganese and copper somewhat reduce it). The authors therefore suggest that one way of raising the softening temperature of transition-class stainless steels is to raise the reverse martensite transformation temperature by additional alloying (e.g. with molybdenum and tungsten). The effects found were similar to those reported by P.Bastien and A.Sulmont (Ref.2) and recall that in Fe-Ni alloys (Ref.3,4). The present authors suggest that the $\alpha(M) \rightarrow \gamma$

transformation in the steels studied during heating occurs in two stages: the first is rapid (diffusionless) and the second is slow (diffusion). This would answer the idea that the martensite type of reverse transformation cannot occur in steels because, as a rule, the temperature ranges for this and for diffusion processes such as carbide separation coincide (Ref.10). There are 4 figures, 2 tables and 10 references: 9 Soviet and 1 non-Soviet.

ASSOCIATION: Institut kachestvennykh staley TsNIIChM
(Quality Steel Institute TsNIIChM)

SUBMITTED: July 19, 1960

Card 3/3

FEL'DGANDLER, E.G., inzh.; PRIDANTSEV, M.V., doktor tekhn.nauk

Effect of heat treatment on transformation in Kh17N7IU-type steel. Stal' 21 no. 1:58-64 Ja '61. (MIRA 14:1)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii.
(Steel alloys--Heat treatment)
(Phase rule and equilibrium)

PRIDANTSEV, M.V., BELJKOVA, E.I., NAZAROV, YE.G.

Production and investigation of refractories on the Fe-Ni-Cr basis.

SPECIAL STEELS AND ALLOYS (SPETSIAL'NYYE STALI I SPLAVY), Collection of Studies, Issue 27, 240 pages, published by the State Scientific and Technical Publishing House for Ferrous and Non-Ferrous Metallurgy, Moscow, USSR, 1962.

PRIDANTSEV, Mikhail Vasil'yevich; OZERETSKAYA, A.L., red. izd-va; ATTOPOVICH, M.K., tekhn. red.

[Effect of impurities in rare earth elements on the properties of alloys]Vliianie primesei i redkozemel'nykh elementov na svoistva splavov. Moskva, Metallurgizdat, 1962. 206 p. (MIRA 15:10)

(Rare earth metals) (Steel alloys--Testing)

S/133/62/000/006/011/015
A054/A127

AUTHORS: Stepanov, V. P., Pridantsev, M. V., Dzugutov, M. Ya.

TITLE: Extra-axial nonhomogeneity of 787 (EI787) steel

PERIODICAL: Stal', no. 6, 1962, 544 - 547

TEXT: It is generally accepted that the tendency to spotty liquation decreases upon raising the nickel content of the alloy. However, the investigations of heat resistant alloys with a nickel content - in some cases as high as 30-40% - [ЭИ696 (EI696), ЭИ 787 (EI787)] or produced on a nickel basis [ЭИ 435 (EI435), ЭИ437 (EI437), ЭИ 765 (EI765), etc.] showed that these alloys are not without this defect. As spotty liquation was found to be pronounced in the EI787 grade, tests were made covering the character of spotty liquation, its effect on the plasticity of the steel and the factors which affect the development of this defect. The steel tested had the following composition (in %): C $\leq$ 0.08, Si $\leq$ 0.60, Mn $\leq$ 0.60, S $\leq$ 0.010, P $\leq$ 0.020, W $\leq$ 2.0 - 4.0, Cr 13.0 - 16.0, Ni 33.0 - 37.0, Ti 2.4 - 3.2, Al 0.7 - 1.7, B 0.03. Structural analyses were made on longitudinal and transverse templates, cut from ingots and forgings. It

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Extra-axial nonhomogeneity of...

was found that spotty liquation developed in zones of increased pickling tendency, containing an excess compound of eutectic character, arranged in the cast or reheated and deformed metal in the form of nets around the micrograins. An increase in the ingot weight and a reduction of the crystallization rate promoted the development of spotty liquation. In ingots weighing 450 kg the number of spots covering 1 dm^2 of the ingot surface amounted to 3, in 2,100-kg ingots to 11. When pouring 50-kg ingots in two different molds (a conventional, cold cast iron mold and a ceramic mold heated to 700°C), at rates of 3 - 5 and 25 - 30 minutes respectively, no spotty liquation was found in the first ingot, whereas it was well-developed in the second. The effect of spotty liquation on the mechanical properties of steel and mainly on its deformability was studied on specimens subjected to the following heat treatment: heating to 1,180°C, holding time 8 hours, heating to 1,050°C, holding time 4 hours, heating to 750°C, holding time 16 hours; (after each heating cycle air-cooling). In the heat-treated specimens spotty liquation did not affect the heat resistance of the ingots, but decreased their strength and ductility at room temperature, mainly in the transverse specimens (in the latter, the ductility decreased by a factor of 2 - 3). This must be put down to the distribution of the eutectic element. The mechanical properties were

tested in transverse specimens at temperatures of 900 - 1,150°C. Up to 1,100°C spotty liquation did not affect the strength and plasticity of the EI787 grade specimens. However, when heated to 1,150°C, the mechanical characteristics (its strength excepted) and ductility of the steel deteriorated considerably. At this temperature, heating and deformation of the metal resulted in cracks in the liquation zones, evidently caused by the melting of the eutectic component. Until now it is not possible to eliminate spotty liquation directly, which in the temperature zones mentioned has no adverse effect on the mechanical properties of the steel. When, however, applying electric arc vacuum remelting and electric slag remelting, moreover semi-continuous casting, the crystallization rate of the metal in the mold can be increased considerably, thus reducing or completely eliminating the formation of spotty liquation. There are 3 figures and 1 table.

PRIDANTSEV, M.V., prof., doktor tekhn.nauk; LEVINZON, Kh.Sh.; LITVENENKO, D.A.; CHIRKIN, V.M.

Heat treatment of low-carbon rolled sheets in conveyer furnaces. Biul.tekh.-ekon.inform.Gos.nauch.-issl.inst.nauch.i tekh.inform. no.11:9-14 '62. (MIRA 15:11)

(Steel, Structural--Heat treatment)

41147
S/133/62/000/011/004/005
A054/A127

18 1130

AUTHORS: Pridantsev, M.V., Doctor of Technical Sciences, Professor, Babakov, A.A., Candidate of Technical Sciences

TITLE: Stainless steels with reduced nickel content

PERIODICAL: Stal', no. 11, 1962, 1035 - 1039

TEXT: High-chrome, low-nickel stainless ferritic steels [X 17 (Kh17), X 28 (Kh28)] are used in some cases to replace high-nickel steel grades, In some aggressive media this is possible, but on the whole their use is limited, because they are inclined to intercrystalline corrosion; when suddenly cooled from temperatures above 900°C, they have a tendency to general corrosion and at high temperatures (during welding, for instance) their grains tend to grow which reduces their notch toughness. To eliminate these drawbacks of low-nickel steels, TsNIIChM established new grades, partly of the ferritic-austenitic and partly of the austenitic type. The aim was to compose alloys with a low nickel content, having just the right amount of the δ-phase, at which the ductility of the steel does not decrease during the hot processes and which at the same time increases notch toughness. As additional austenite-forming elements manganese and nitrogen

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Stainless steels with .....

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were used in the tests. The new ferritic-austenitic grades have the following composition and mechanical characteristics:
Table 2:

Сталь (1)	Химический состав, % (2)						Механические свойства* (3)			
	C ≤	Mn ≤	Si ≤	Cr	Ni	Ti	σ_B kg/mm²	σ_t kg/mm²	δ %	a_k kgm/cm²
0Х21Н3Т (ЭП214) (4)	0,08	0,80	0,80	20,5—22,5	3—3,5	0,3—0,5	50	30	20	2
0Х21Н5Т (ЭП53) (5)	0,08	0,80	0,80	20,0—22,0	4,8—5,8	0,3—0,5	65	35	25	6
1Х21Н5Т (ЭИ811) (6)	0,09—0,14	0,80	0,80	20,0—22,0	4,8—5,8	0,35—0,7**	70	40	20	6
0Х21Н6М2Т (ЭП54) (7)	0,08	0,80	0,80	20,0—22,0	5,5—6,5	0,3—0,5**	70	40	20	6
Х28Н4 (8)	0,15	0,80	1,00	26—29	3,5—4,5	0,2	48	—	18	5

(4) * Минимально гарантируемые после закалки с 950—1000° с охлаждением на воздухе. ** Кроме того, 1,8—2,5% Mo. *** Из расчета 5 (C — 0,02) %, но не более 0,7%.

Legend: 1 - Steel; 2 - Chemical composition, %; 3 - Mechanical properties; 4 - [0Kh21N3T(EP214)]; 5 - [0Kh21N5T(EP53)]; 6 - [1Kh21N5T(EI811)];

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Stainless steels with.....

7 - [OKh21N6M2T(Ep54)]; 8 - (Kh28N4);
9 - Remarks: 1-the minimum values are guaranteed after hardening from 950 - 1000°C and air cooling; 2- Calculating 5 (C-0.02%) but not more than 0.7%. 3- Moreover: 1.8 - 2.5% Mo.

The use of the new grades saves 50 - 60 kg nickel per ton of steel. The economy is even greater, as they have a higher strength and therefore less steel is required for making machines, constructions. Their heat expansion coefficient is lower than that of austenitic grades and consequently lower stresses arise in the welding seams. Moreover, they tend to crack less under stresses and no intercrystalline corrosion develops in them. Their higher chrome content makes the new ferritic-austenitic grades just as resistant to aggressive media as the steels containing nickel, to some substances they even display a higher resistance. The 1 X18H 9T (1Kh18N9T) grade can best be replaced by the OKh21N5T grade, while the 1 X18H 12M 2T (1Kh18N12M2T) grade by the OKh21N6M2T grade. However, the new ferritic-austenitic grades tend to become brittle, which means that they cannot be exposed to temperatures above 350°C. As their grains tend to grow when heated to high temperatures, rolling, forging, hardening them must be carried out at corresponding lower temperatures, than those applied to the conventional grades.

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Stainless steels with.....

S/133/62/000/011/004/005
A054/A127

Overheating increases the amount of the ferritic phase, upon heating to 850 - 1050°C a reversed [illegible] transformation takes place in the new steel grades. TsNIIChM also established a number of new austenitic type grades, in which manganese and nitrogen are used to replace part of the nickel, as austenite forming element. In two grades [X 14Г 14 H (Kh14G14N) and X 14Г 14H 3T (Kh14G14N3T)] only manganese is used besides nickel for this purpose. To these two grades not more than 12 - 14% chrome can be added in order to make the formation of the austenitic phase possible. The composition of the new austenitic grades and their mechanical characteristics are given in Table 5:

Legend: 1 - Steels; 2 - Chemical composition, %; 3 - Other elements; 4 - Mechanical properties; 5 - 1Kh18N9T (given for comparison); 6 - [Kh17N4AG9(EI878)]; 7 - (Kh18N5G9AB; 8 - [Kh22N5AG9(EP20)]; 9 - [Kh17AG14(EP213)]; 10 - [Kh17N5G9AB(EP55)]; 11 - [OKh20N4AG10(NN3)]; 12 - [OKh20N5G12AB(NN3B)]; 13 - [Kh14G14N(EP212)]; 14 - [Kh14G14N3T(EI711)];
15 - Remarks: 1- calculating 5(C-0.02), where C-the carbon content, in %, but not more than 0.8%; 2- calculating a tenfold content of carbon, but not more than 0.8%; idem, but with an upper threshold of 0.95%; 4- calculating 5(C-0.02), but not more than 0.6%.

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Stainless steels with.....
Table 5

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Сталь (1)	Химический состав, % (2)						Другие элементы (3)	Механические свойства (4)		
	C ≤	Cr	Ni	Mn	Si	N_2		σ_B кг/мм²	σ_t кг/мм²	δ %
1Х16Н9Т (5)	0,12	17—20	9—11	1—2	0,8	—	Ti*1	60	25	40
Х17Н4АГ9 (ЭИ878) (6)	0,12	16—18	3,5—4,5	8—10	0,8	0,18—0,25	—	70	40	40
Х18Н5Г9АБ (7)	0,8	18—20	4,5—5,5	6,0—10,0	0,8	0,25—0,30	} Nb*2	80	45	35
Х22Н5АГ9 (ЭП220) (8)	0,09	21—23	4,5—5,5	8—10	0,8	0,35—0,45		80	45	40
Х17АГ14 (ЭП213) (9)	0,15	16—18	0,6	13,5—15,5	0,8	0,30—0,40		75	40	45
Х17Н5Г9АБ (ЭП55) (10)	0,08	16—18	4,5—5,5	8—10	0,6	0,18—0,25	} Nb*3	80	40	40
0Х20Н4АГ10 (НН3) (11)	0,08	17,5—20,5	4—5	10—12,5	0,8	0,4—0,5		85	50	35
0Х20Н5Г12АБ (НН3Б) (12)	0,08	18—20	4,5—5,5	11,5—13,5	≤0,8	0,4—0,5	Nb*3	85	50	35
Х14Г14Н (ЭП212) (13)	0,12	13—15	1—2	13—15	≤0,8	—		70	30	45
Х14Г14Н3Т (ЭИ711) (14)	0,10	13—15	2,5—3,5	13—15	≤0,8	—	Ti*4	70	30	45

*1 Из расчета 5 (C — 0,02), где C — содержание углерода, %, но не более 0,8%. *2 То же, но с верхним пределом 0,95%. *3 Из расчета 5 (C — 0,02), но не более 0,6%. *4 Из расчета десятикратного содержания углерода, но не более 0,8%.

The strength properties of these grades are better than those of conventional

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chrome-nickel alloys. The solid solution is considerably strengthened by the adsorption of nitrogen and manganese atoms. The addition of niobium (which forms stable compounds in the presence of nitrogen) increases the resistance to intercrystalline corrosion. In this case, however, part of nickel is bonded to nitrogen and this decreases its autenite forming effect. There are 9 figures and 5 tables.

PRIDANTSEV, M.V.; BELIKOVA, E.I.; NAZAROV, Ye.G.

Investigation of heat-resistant alloys on an iron-nickel-chromium base. Sbor.trud.TSNIICHM no.27:93-138 '62. (MIRA 15:8)
(Iron-nickel-chromium alloys--Thermal properties)

STEPANOV, V.P.; PRIDANTSEV, M.V.; IZUGUTOV, M.Ya.

Extra-axial heterogeneity in EI787 steel. Stal' 22 no.6:544-547 Je '62. (MIRA 16:7)
(Steel--Metallography)

PRIDANTSEV, M.V., dqktor tekhn.nauk, prof.; BABAKOV, A.A., kand.tekhn. nauk

Stainless steel with a lower nickel content. Stal' 22 no.11:1035-1039 N '62. (MIRA 15:11)
(Steel, Stainless--Analysis) (Nickel--Analysis)

PRIDANTSEV, M.V., doktor tekhn.nauk, prof.; LEVIN, F.L., inzh.

Highly resistant nonmagnetic steel. Metalloved. i term. obr. met. no.1:41-44 Ja '63. (MIRA 16:2)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii.

(Steel, Stainless—Testing)

PRIDANTSEV, M. V.
AID Nr. 994-12 20 June

ELECTROSLAG MELTING OF ЭИ787 ALLOY (USSR)

Pridantsev, M. V., I. G. Sokolov (Deceased), and A. I. Kondrat'yev.
Avtomaticheskaya svarka, no. 3, Mar 1963, 7-12.
S/125/63/000/003/002/012

The Institute of Metallurgy imeni A. A. Baykov, in cooperation with the Central Scientific Research Institute of Ferrous Metallurgy imeni I. P. Bardin and the "Elektrostal'" Plant, has investigated the effect of electroslag melting on the mechanical properties, particularly forgeability, of ЭИ787 heat-resistant Fe-Ni-base alloy. The 1000 to 1250-kg consumable electrodes made of conventionally arc-melted steel were remelted under АН-6 flux [65% CaF_2, 35% Al_2O_3] into 910 to 1275-kg ingots. The electroslag-melted alloy contained 0.08% C, 0.50% Si, 0.33% Mn, 2.93% W, 14.05% Cr, 34.4% Ni, 2.66% Ti, 1.24% Al, 0.010% B. Except for an average loss of 18% Al and 13% Ti, electroslag melting had no significant effect on the content of the alloying elements.

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ELECTROSLAG MELTING [Cont'd] S/125/63/000/003/002/012

However, it lowered O content to 0.0041% and nonmetallic inclusions to 0.001%, compared with 0.0080% and 0.005% in the conventionally melted alloy; the H content and the composition of the nonmetallic inclusions remained practically unchanged. The tensile strength at 860 to 1200°C of the electroslag-melted alloy in as-cast or forged condition was almost the same as that of the conventionally melted alloy; at lower temperatures electroslag-remelted metal was somewhat stronger. Elongation of the as-cast electroslag metal at all temperatures up to 1200°C was double that of the conventional metal; at 800 to 1200°C the forged electroslag metal had a 30 to 40% greater elongation than the conventional metal. As-cast electroslag metal in the 800-1000°C range had a reduction of area 10 to 15% higher than that of the conventional metal; the reduction of area of forged electroslag metal was four times as high as that of conventional metal at 800°C and 10 to 15% higher at 900 to 1100°C. At temperatures over 1100°C, both elongation and reduction of area dropped

AID Nr. 994-12 20 June

ELECTROSLAG MELTING [Cont'd]

S/125/63/000/003/002/012

sharply, regardless of condition and melting method, because of the formation of low-melting boron eutectic at the grain boundaries. The notch toughness of the as-cast electroslag metal was 50 to 60%, and of the forged metal 15 to 25%, higher than that of the conventional metal. In torsion tests, the as-cast or forged electroslag metal in the 800 to 1150°C range withstood 2 to 4 times as many turns as conventional metal. In upsetting at 800 to 1200° C, the as-cast electroslag metal required 15 to 25% less pressure than the conventional metal for the same reduction; forged metal, regardless of the method of melting, required 20 to 30% more pressure than as-cast metal for the same reduction. The maximum one-stroke reduction (press or hammer) was 40% for as-cast electroslag metal and 25 to 30% for conventional metal; for forged electroslag metal, it was 15 to 20% higher than for as-cast metal. The better forgeability of the electroslag metal is attributed to a lower content of nonmetallic inclusions and a better macrostructure of the ingots. [MS]

Card 3/3

PRIDANTSEV, M.V.; NAZAROV, Ye.G.

Effect of cold, plastic deformation on the properties of the KhN35VTIU alloy. Metalloved. i term. obr. met. no.11:52-53 N '63. (MIRA 16:11)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii.

NAZAROV, Ye.G.; PRIDANTSEV, M.V.

Transformation characteristics of the intermetallide γ'-phase into the acicular γ''-phase in the KhN35VTIU alloy. Sbor. trud TSNIICHM no.35:24-30 '63. (MIRA 17:2)

PRIDANTSEV, M.V., doktor tekhn.nauk, prof.; LANSKAYA, K.A., kand.tekhn.nauk

Safety factor and choice of permissible stresses in the calculation of boiler pipes. Teploenergetika 10 no.1:61-64 Ja '63. (MIRA 16:1)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii. (Boilers) (Steampipes)

PRIDANTSEV, M. V.; SOKOLOV, I. G.[deceased]; KONDRAT'YEV, A. I.

Effect of electric slag refining on the technological plasticity of iron-nickel-chromium base alloys. Avtom. svar. 16 no.3:7-12 Mr '63. (MIRA 16:4)

1. Institut metallurgii imeni A. A. Baykova (for Pridantsev).
2. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii (for Sokolov, Kondrat'yev).

(Iron-nickel-chromium alloys—Electrometallurgy)
(Zone melting)

L 12639-63 BDS/EWP(q)/EWT(m) AFFTC/ASD JD/HW-2

ACCESSION NR: AP3001470 S/0133/63/000/005/0453/0458 63

AUTHOR: Pridantsev, M. R. (Dr. of technical sciences, Professor); Nazarov, Ye. G. (Engineer); Belikova, E. I. (Candidate of technical sciences)

TITLE: Structural transformations in Fe-Ni-Cr-Ti alloy E1787

SOURCE: Stal', no. 5, 1963, 453-458

TOPIC TAGS: Fe, Ni, Cr, Ti, Al, alloy E1787, heat treatment, tempering, soaking, hardening, solid solution, plastic deformation

ABSTRACT: The heat resisting alloy E1787 with a chemical composition of up to 0.08% C, up to 0.6% Si, up to 0.6% Mn, 12-16% Cr, 33-37% Ni, 2-4% W, 2.4-3.2% Ti, 0.7-1.5% Al and up to 0.03% B, was studied at TsNIIChM. Experiments included heat treating and tempering in air and water at temperatures up to 1180C and soaking times up to 2000 hours. It is concluded that the process of hardening consists of three phases. 1) The transformation at 500-650C characterized by the increase in electrical resistance of alloy. 2) The development of aging processes at 650-900C; this phase represents a solid solution of Ni, Fe, and Al with the compound Ni_3Ti. 3) The formation of a stable lamellar or acicular phase of the type $(Ni,Fe)_3(Ti,Al)$ at 900-950C. The formation of this phase at 850-800C is possible only after a long

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L 12639-63

ACCESSION NR: AP3001470

soaking, but at 950C it separates immediately from the solid solution. The transformation of structure from the second to the third phase is due to the tendency of the metastable phase to pass into a more stable one. The plastic deformation of the alloy and a higher titanium content accelerates the building of the third phase. Orig. art. has: 13 figures and 2 tables.

ASSOCIATION: none

SUBMITTED: 00	DATE ACQ: 10Jun63	ENCL: 02
SUB CODE: 00	NO REF SOV: 004	OTHER: 000

Card 2/2

PRIDANTSEV, M. V.

"Creep-resisting precipitation-hardening iron-base alloys."

report presented at the Symp on Heat-Resistant Metallic Materials, Prague, 3-5 Sep 64.

Inst Metallourgy im A A Baykov, Moscow.

ACCESSION NR: AT4033719 S/0000/64/000/000/0334/0345

AUTHOR: Stepanov, V. P.; Pridantsev, M. V.; Topilin, V. V.; Dzugutov, M. Ya.

TITLE: Effect of inertial stirring of metal during crystallization on development of spotty liquation and ingot structure

SOURCE: USSR. Komissiya po fiziko-khimicheskim osnovam proizvodstva stali. Fizikokhimicheskiye osnovy* metallurgicheskikh protsessov (Physico-chemical basis of metallurgical processes); sbornik statey. Moscow, Metallurgizdat, 1964, 334-345

TOPIC TAGS: foundry technique, casting technique, heat resistant alloy, mold charge stirring, ingot structure, spotty liquation, mold rotation, inertial stirring

ABSTRACT: Ingots of heat resistant alloys (Cr-Ni or Fe-Cr-Ni base with Ti, Aℓ, B or other elements), weighing 50, 1000 and 2100 kg were cast with the mold charge stirred inertially while the metal crystallized. The shapes of the ingots were round and cylindrical, round with tapers of 8 or 15°, octahedral and triconical, respectively. Stirring was in the form of retrorotary motion of the suspended charged mold, the latter's return travel being 60 to 80° for the heavier ingots and 160 to 180° for the 50 kg pieces. Stirring periods ranged from 20 to 90 min. for the former and 5 to 39 min. for the latter, at frequencies of 8 to 25 agitations per minute. Stirring reduced or eliminated

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ACCESSION NR: AT4033719

spotty liquation and produced a uniform, fine-grained cast structure in the stirring zone. Two cast structure zones with a liquation ring in between occur in an ingot where available facilities do not allow the stirring of the metal immediately after or during the charging of a mold. "N. A. Shiryayev, N. D. Orekhov, G. I. Bury*lichev and L. F. Cherny*sheva also took part in the work." Orig. art. has: 6 illustrations.

ASSOCIATION: Komissiya po fiziko-khimicheskim osnovam proizvodstva stali (Committee on the Physico-Chemical Basis of Steel Production)

SUBMITTED: 18Oct63	DATE ACQ: 16Apr64	ENCL: 00
SUB CODE: MM	NO REF SOV: 004	OTHER: 000

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ACCESSION NR: AP4019806 S/0279/64/000/001/0045/0047

AUTHOR: Pridantsev, M. V. (Moscow); Stepanov, V. P. (Moscow); Topilin, V. V. (Moscow); Klyuyev, M. M. (Moscow)

TITLE: Effect of electroslag melting on the macrostructure of alloy KhN35VTYu

SOURCE: AN SSSR. Izv. Metallurgiya i gornoye delo, no. 1, 1964, 45-47

TOPIC TAGS: alloy KhN35VTYu, alloy macrostructure, spotted liquation, electroslag melting, slag ANF-6, slag AN291

ABSTRACT: This economical multi-component alloy on an Fe-Cr-Ni base, designated for use under extensive stress at high temperatures and representing an excellent substitute for similar Cr-Ni based systems, is limited in its applications by a tendency to spotty liquation. The authors investigated the effects of chemical composition and the quantity of slag ANF-6 (30-40% Al_2O_3, 60-70% CaF_2) or AN291 (39-43% Al_2O_3, 16-20% CaF_2, 22-26% CaO, 14-20% MgO), as well as of electrical current factors and electromagnetic stirring of the slag and metallic baths, on the macrostructure and surface quality of 1200-kg ingots of this alloy obtained by smelting cast or forged electrodes (200 mm) on the P-951 apparatus in a 425-mm diameter crystallizer. It is concluded that ingots of such size can be obtained free of spotty liquation when the build-up rate is held to 165-200 kg/hr (61 v,

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51"

ACCESSION NR: AP4019806

5.5-6.5 ka). The slow build-up rate is the decisive factor in obtaining ingots with satisfactory macrostructure. "Ye. V. Voynovskiy, N. P. Druzhinina, N. K. Kernich, M. I. Pichugina, L. F. Cherny*sheva and A. F. Raskova also participated in this study". Orig. art. has: 6 illustrations and 1 table.

ASSOCIATION: none

SUBMITTED: 26Jul63 DATE ACQ: 31Mar64 ENCL: 00

SUB CODE: ML NO REF SOV: 004 OTHER: 001

Card 2/2

ACCESSION NR: AP4029835 S/0279/64/000/002/0110/0116

AUTHOR: Stepanov, V. P. (Moscow); Pridantsev, M. V. (Moscow); Kernich, N. K. (Moscow)

TITLE: On the extra-axial liquation inhomogeneity in chrome-nickel alloy ingots

SOURCE: AN SSR. Izv. Metallurgiya i gornoye delo, no. 2, 1964, 110-116

TOPIC TAGS: chrome nickel alloy, alloy ingot, ingot structure, structure inhomogeneity, Kh20N80 alloy, segregation inhomogeneity, KhN77TYuR, KhN77TYu

ABSTRACT: This paper presents results of a study of the effect of some alloying elements on the formation of off-center segregation inhomogeneity in chromium-nickel and iron-chromium-nickel base alloys, as well as the chemical composition and microstructure of the segregation zones. The authors studied the effects of boron in Kh20N80 alloy in which off-center segregation does not arise under any condition; the effects of titanium and aluminum, separately and jointly, in both Kh20N80 and on KhN35VTYu alloys; the effects of niobium and carbon in KhN77TYuR alloy. The results are presented in a table, with photomicrographs of the microstructure of the segregation zone in the KhN77TYuR and KhN77TYu alloys. The

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ACCESSION NR: AP4029835

authors drew the following conclusions: 1) the tendencies of steels and alloys to form off-center segregation inhomogeneity in ingots is determined by their chemical composition, 2) a smaller segregation inhomogeneity in ingots can be obtained by decreasing the content or totally eliminating certain elements such as titanium, aluminum, and boron from the alloy and by introducing new elements that may bind the segregation elements into compounds at an early crystallization stage, 3) in chromium-nickel base alloys containing titanium and aluminum, a decrease in the segregation inhomogeneity can be obtained by adding a specific amount of niobium. Orig. art. has: 5 figures and 3 tables.

ASSOCIATION: none

SUBMITTED: 29Apr63 ENCL: 00 SUB CODE: MM

NO REF SOV: 011 OTHER: 001

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ACCESSION NR: AP4029129 S/0133/64/000/004/0349/0353

AUTHORS: Pridantsev, M. V. (Doctor of technical sciences, Professor); Estulin, G. V. (Doctor of technical sciences, Professor) (Deceased); Zimina, L. N. (Candidate of technical sciences)

TITLE: Influence of molybdenum and tungsten on the properties of heat-resistant nickel alloys

SOURCE: Stal', no. 4, 1964, 349-353

TOPIC TAGS: nickel alloy, heat-resistant alloy, molybdenum, tungsten, alloy hardness, softening temperature, alloy KhN77TYu, alloy Kh65TYu, alloy KhN67VMTYu, ultimate stress

ABSTRACT: Nickel-based alloys with 20-21% of chromium, 2.4-2.7% of titanium, and 0.7-1.4% of aluminum were investigated for the influence exerted on them by molybdenum and tungsten. One group of samples was alloyed with 5% of molybdenum and with various amounts of tungsten (up to 22%), the other was alloyed with 4% of tungsten and with various amounts of molybdenum (up to 15%). All alloys with Mo + W content of 15-20% were satisfactory for hot working (forging and rolling),

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ACCESSION NR: AP4029129

but with the further increase of Mo and W their malleability decreased and their hardness increased. Addition of Mo to alloy KhN77TYu with 4% of W moved the maximum hardness point toward higher temperatures (from 750 to 850C). Analogous alloys containing 4.8% Mo reached their maximum hardness at 900C when carrying 11% of W. All samples were quenched at 1250C to increase the grain size in the solid solutions. Addition of either Mo or W increased both strength and plasticity of alloy Kh65TYu and lengthened its time to failure, as can be seen from Fig. 1 of the Enclosures. Alloy KhN67VMTYu (developed by the authors) is economical and extremely heat resistant. It contains (aside from 0.01% of boron and cerium) the following elements (in %):

C	Si	Mn	S	P	Fe
<0,08	<0,6	<0,5	<0,01	<0,015	<4,0

Cr	Mo	W	Ti	Al
17,0—20,0	4,0—5,0	4,0—5,0	2,2—2,8	1,0—1,5

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ACCESSION NR: AP4029129

Quenching in a 10% solution of sodium chloride produces a single-phase structure in this solid solution. The changes which appear in it after 15 hours of aging at various temperatures are shown in Table 1, and its rupture stresses at various temperatures can be seen in Table 2 of the Enclosures. This alloy (with a total content of 8-10% of Mo and W) may be used in parts to be worked under high stresses in the temperature range of 850-900C. Because of its plasticity it can resist extreme concentration of stresses in grooves and notches. Orig. art. has: 7 graphs, 2 photographs, and 4 tables.

ASSOCIATION: Institut metallurgii im. A. A. Baykova i TsNIICHM (Institute of Metallurgy); TsNIICHM

SUBMITTED: 00 DATE ACQ: 28Apr64 ENCL: 03

SUB CODE: ML NO REF SOV: 003 OTHER: 000

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PRIDANTSEV, M.V. (Moskva); LEVIN, F.L. (Moskva)

Hardening of nonmagnetic steel by alloying and heat treatment. Izv. AN SSSR. Met. i gor. delo no.4:116-122 Jl-Ag '64. (MIRA 17:9)

PRIDANTSEV, M.V.

[redacted], M.V., doktor tekhn. nauk, prof.; ESTULIN, G.V., doktor tekhn. nauk, prof. [deceased]; ZIMINA, L.N., kand. tekhn. nauk

Effect of molybdenum and tungsten on the properties of heat-resistant nickel alloys. Stal' 23 [i.e. 24] no.4:349-353 Ap '64. (MIRA 17:8)

1. Institut metallurgii im. A.A. Baykova i TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii im. Bardina.

L 38913-65 EPA(s)-2/ENT(m)/EWA(d)/EWP(t)/EPA(bb)-2/EWP(b) Pad/Pt-10 IJP(c)
MJW/JD/HW

ACCESSION NR: AP5001610 S/0279/64/000/006/0081/0085

AUTHOR: Pridantsev, M. V.; Stepanov, V. P.; Tal'yantsev, V. S.; Topilin, V. V.; Voynovskiy, Ye. V.

TITLE: Effect of electrical operating conditions of vacuum arc remelting on extra-axial liquation in heat-resistant alloys

SOURCE: AN SSSR. Izvestiya. Metallurgiya i gornoye delo, no. 6, 1964, 81-85

TOPIC TAGS: extra axial liquation, vacuum arc melting, heat resistant alloy, operating condition KhN35VTYu alloy, KhN77TYuR alloy

ABSTRACT: By vacuum arc melting KhN35VTYu and KhN77TYuR alloys under optimum electrical conditions it was possible to obtain 800 kg, 380 mm diameter, ingots free of extra-axial liquation nonuniformities. This was achieved in TSEP-359B and VD-2 type vacuum arc furnaces at melting rates of 3.5 and 3.3 kg/min (I = 5.2 ka, V = 26-28v). The electrical rating of the arc and the resultant rate of melting, and of crystallization, are the determinants of extra-axial liquation in the ingots. Increasing the power of the arc and the rate of melting

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L 32913-65
ACCESSION NR: AP5001610

above a value determined for each alloy caused formation of extra-axial liquation while melting at too slow rates led to cooling of the metal at the crystallizer walls and formation of coarse involutions. The structure and form of the extra-axial liquations in ingots formed under unfavorable melting conditions were similar to liquation in large ingots obtained by conventional methods. When a solenoid was used with direct current in vacuum arc melting of the KhN35VTYu alloy, strongly developed liquation nonuniformity of a peculiar form appeared, even under those conditions which, without the solenoid, formed metal free of the extra-axial liquation. This liquation was caused by the circulation of the liquid metal bath under the effect of the magnetic field of the solenoid and separation of the liquid and solid phases during crystallization. Use of a solenoid with alternating current had little effect on the degree of extra axial liquation developed. "A. Ya. Leyzerova, N. K. Kernich, T. S. Rozanova, L. F. Cherny*sheva, M. I. Pichugina, T. I. Pentyak took part in conducting the experiments." Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Moskva-Elektrostal' (Electric Steel)
SUBMITTED: 27Dec63 ENCL: 00 SUB CODE: GC, MM
NR REF SOV: 005 OTHER: 000
Card 2/2

ASTAF'YEV, A.S., kand.tekhn.nauk; PRIDANTSEV, M.V., doktor tekhn.nauk

Effect of welding conditions on the fatigue strength of certain low-alloy steels. Stal' 24 no.2:157-163 F '64. (MIRA 17:3)

BANNYKH, Oleg Aleksandrovich; KOVNERISTYY, Yuliy Konstantinovich; ZUDIN, Ivan Feofanovich. PRIDANTSEV,M.V., prof.doktortekhn.nauk otv.red.; CHERNOV,A.N., red.

[Heat-resistant chromium-manganese steel with aluminum] Khromomargantsovistye teploustoichivye stali s aliuminiem. Moskva, Nauka, 1965. 101 p. (MIRA 18:3)

(N) L 12094-66 EWT(m)/EWP(e)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b) IJP(c)

ACC NR: AP6000603 SOURCE CODE: UR/0129/65/000/012/0010/0014

MJW/JD/HW/JG

AUTHOR: Pridantsev, M. V.; Levin, F. L.

ORG: TsNIIChERMET

TITLE: Effect of manganese on the structure and properties of nonmagnetic stainless steels

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 12, 1965, 10-14

TOPIC TAGS: manganese containing steel, stainless steel, magnetic permeability, nitrogen, ferrite

ABSTRACT: The authors present the results of an investigation of the steels Kh18N4, Kh15N4 and Kh8N9 (containing 8-16% Mn) as well as of steels additionally alloyed with nitrogen. Presence of the ferromagnetic component was determined by the differential method according to the degree of magnetic saturation. The measurements were performed in a magnetic field with an intensity of 200 e. The figures on magnetic saturation were recalculated in terms of magnetic permeability. Findings: Mn increases the yield point of austenitic steels. For two-phase austenite-ferrite steels containing 4% Ni, the effect of Mn depends on the Cr content: a) in steels containing 18% Cr the amount of austenitic phase increases as the Mn content increases to 14%, but the ferritic component cannot be completely eliminated on alloying with Mn;

Card 1/2 UDC: 620.17:669.14.018.5

b) in steels containing 15% Cr the formation of austenitic structure requires 14% Mn. In order to obtain an austenitic structure in stainless steels containing 18% Cr and 4% Ni, it is necessary to add nitrogen in addition to Mn. Nitrogen is added as an alloy element to stainless steels, because it expands the α-region and strengthens austenite without vitiating corrosion resistance. The solubility of nitrogen in austenite increases with increasing content of Mn. Mn acts as an austenite-forming element which contributes to reducing the amount of the α-phase in two-phase steels of the Kh18N4 type. The effect of Mn is particularly marked in the presence of high hardening temperatures. For example, in specimens quenched from 1250°C increasing the Mn content from 10 to 14% reduces magnetic permeability 1.5 times for steels with 18% Cr and 2 times for steels with 15% Cr. This must be taken into account when developing low-magnetic Cr-Ni-Mn steels requiring high hardening temperatures. Orig. art. has: 2 tables, 3 figures.

SUB CODE: 11, 13, 20/ SUBM DATE: none/ ORIG REF: 003/ OTH REF: 001

PRIDANTSEV, M.V.; LEVIN, F.L.

Effect of manganese on the structure and properties of non-magnetic stainless steel. Metallovec. i term. obr. met. no. 12:10-14 D '65. (MIRA 18:12)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii imeni Bardina.

L 17615-66 EWT(m)/EWA(d)/EWP(t)/EWP(k) MJW/JD/HW
ACC NR: AP6007106 (N) SOURCE CODE: UR/0129/66/000/002/0025/0029

AUTHOR: Bannykh, O. A.; Kovalenko, O. I.; Pridantsev, M. V.

ORG: Institute of Metallurgy im. A. A. Baykov (Institut metallurgii)

TITLE: Strengthening of chromium-manganese-molybdenum steel by cold plastic deformation

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 2, 1966, 25-29

TOPIC TAGS: steel, chromium steel, manganese containing steel, molybdenum containing steel, steel strengthening, thermomechanical treatment, strengthening treatment, low temperature treatment, steel treatment, steel property/~~28Kh10G8M4~~

ABSTRACT: The effect of cold working on strengthening 28Kh10G8M4 steel has been investigated. Five steel heats containing 0.26—0.35%C, 0.6—0.7% Si, 6.8—9.4% Mn, 10.1-10.3% Cr and 4.3—4.5% Mo were preforged into 22 x 22 mm bars, heated to 1100C, rolled to a thickness of 4—4.2 mm, and water quenched. Then part of the specimens were austenitized at 800—1100C and water quenched and all the specimens were cold rolled with reductions up to 45%. It was found that cold rolling increased the hardness and strength of all steels proportionally to reduction. The strength of specimens which received additional heat treatment after hot rolling was found to be lower than that of specimens which were cold rolled directly after hot rolling. After cold rolling with a reduction of 25—30% and tempering at 500C, the latter had a tensile

UDC: 669.15—194:669.26'74'28:539.374

Card 1/2

L 17615-66

ACC NR: AP6007106

strength of 189—215 kg/mm^2, a yield strength of 136—159 kg/mm^2, an elongation of 15—21%, and a notch toughness of 7.0—7.9 mkg/cm^2. Corresponding figures for the former were 182—186 kg/mm^2, 148—153 kg/mm^2, 9—22% and 2.7—7.6 mkg/cm^2, respectively. Increasing the reduction to 40% brought about a further increase of tensile strength and, especially, of yield strength in specimens cold rolled directly after hot rolling. The strengthening effect of cold rolling is preserved, at least partially, at temperatures up to 550C. At 450C the tensile strength was 155—160 and at 550C about 150 kg/mm^2. Tempering temperatures of 200C to 500C have almost no effect on notch toughness. However, heat treatment prior to cold rolling has an adverse effect on notch toughness, which in specimens tempered at 200C for instance, drops to 1.9 kgm/cm^2. The strengthening effect of cold deformation is due to the formation of martensite of deformation and to strain hardening of austenite. Orig. art. has: 4 figures and 4 tables. [ND]

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 002/ ATD PRESS: 4210

Card 2/2

L 42922-66 EWT(m)/EWP(t)/ETI IJP(c) JD/JI
ACC NR: AP6029056 SOURCE CODE: UR/0413/66/000/014/0082/0082

INVENTOR: Averchenko, P. A.; Alekseyenko, M. F.; Babakov, A. A.; Babitskaya, A. N.; Batrakov, V. P.; Bondarenko, A. L.; Gabuyev, G. Kh.; Yel'tsov, K. S.; Kulygin, G. V.; Loiá, V. N.; Orekhov, G. N.; Pridantsev, M. V.; Sklyarov, P. I.; Smolyakov, V. F.; Soroko, L. N.; Solov'yev, L. L.; Frantsov, V. P.; Shamil', Yu. P.; Moshkevich, Ye. I.; Natanov, B. S.

ORG: none

TITLE: Stainless steel. Class 40, No. 183947.

SOURCE: Izobret prom obraz tov zn, no. 14, 1966, 82

TOPIC TAGS: stainless steel, chromium titanium steel, molybdenum containing steel, nitrogen containing steel, titanium containing steel

ABSTRACT: This Author Certificate introduces a stainless steel containing chromium, molybdenum, and nitrogen. In order to improve weldability, the steel has the following composition: 0.08% C, up to 0.8% Mr, up to 0.8% Si, 15—18% Cr, 0.2—0.6% Mo, 0.04—0.15 N, 0.4—1.2% Ti, up to 0.035 S, and up to 0.030 P. [WW]

SUB CODE: 11/ SUBM DATE: 30Jan65/ AFD press: 2015

Card 1/1 UDC: 669.14.018.8: 669.15'26-194